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(54) LIGHTWEIGHT POLYESTER FILM AND PRODUCTION THEREOF

(57)Abstract:

PURPOSE: To improve strength, heat resistance, hiding power, and writing suitability by stretching a film obtained from a composition comprising a crystalline polyester resin and a specific polymer obtained by hydrogenating a polymer formed by the ring-opening polymerization of dicyclopentadiene.

CONSTITUTION: 50-95wt.% crystalline polyester resin (A) having an intrinsic viscosity of 0.4dl/g or higher is blended with 50-5wt.% polymer (B) obtained by hydrogenating a polymer formed by the ring-opening polymerization of dicyclopentadiene, the component (B) having a glass transition temp. higher by at least 10°C than that of the component (A). An unstretched polyester film obtained by melt-extruding the composition is stretched at least monoaxially in a stretch ratio of 1.5 or higher in a temp. range of from the glass transition temp. to the crystallization temp. of the component (A). Thus, the title film is obtained in which the component (B) is present as dispersed particles having diameters of 0.1-20μm and which contains fine voids and has an apparent specific gravity of 0.3-1.3.

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CLAIMS

[Claim(s)]
[Claim 1] Less than 95 % of the weight 50 % of the weight or more, crystalline polyester resin (A) And it is the polyester film with which the ring-opening-polymerization field hydride (B) of the dicyclopentadiene which has a glass transition temperature higher at least 10 degrees C than crystalline polyester resin consists of 5 to less than (the sum of (A) and (B) is 100 % of the weight) 50% of the weight of a constituent. [or more] The lightweight-ized polyester film which the ring-opening-polymerization field hydride (B) of this dicyclopentadiene is distributing 20 micrometers in the shape of grain from the diameter 0.1 in this polyester film, and a detailed void exists, and is characterized by apparent specific gravity being 0.3 to 1.3.
[Claim 2] Crystalline polyester resin Less than 95 % of the weight 50 % of the weight or more (A) And melting extrusion of the constituent which consists of less than (the sum of (A) and (B) is 100 % of the weight) 50 % of the weight is carried out from the amount in which the ring-opening-polymerization field hydride of the dicyclopentadiene which has a glass transition temperature higher at least 10 degrees C than crystalline polyester resin exceeds 5 % of the weight. The manufacture technique of the lightweight-ized polyester film according to claim 1 characterized by extending the non-extended polyester film obtained 1.5 or more times on at least 1 shaft in the domain of the temperature below crystallization temperature more than the glass transition temperature of this crystalline polyester resin.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] Including a detailed void, this invention is a low density (an apparent specific gravity is smallness), and relates to the polyester film excellent in an intensity, thermal resistance, concealment nature, and note nature, and its manufacture technique. With the outstanding property, the lightweight-ized polyester film of this invention is used for a label, an information, drawing paper, a print sheet, etc.
[0002]
[Description of the Prior Art] the technique (for example, JP,50-38765,A, JP,57-46456,B, JP,57-34931,A) of adding (**) gas or the vaporizable matter as an attempt which lightweight-izes a polyester film, and (**) -- the technique (for example, JP,52-43871,A, JP,58-50625,B) of adding the matter which generates gas by the chemical reaction, and the matter ****** to (**) solvent are added, and the method (for example, JP,51-34963,A, JP,52-27666,B) of extracting this by the solvent behind etc. is learned However, no such technique is almost put in practical use. Although it is possible to make a void generate in a polyester film by such technique as the ground, the control of the size is very difficult, and it is mentioned that the fraction with an extremely low intensity generates the spatial distribution in the thing been easy to become uneven, therefore a polyester film it is not only easy to become a big and rough void, but, and a disconnection of a film tends to happen at the time of extension etc. The film furthermore obtained by such technique was not what can be satisfied in the lightweight nature, an intensity, concealment nature, note nature, and the homogeneity of a performance.
[0003] The technique of generating a void is proposed by carrying out melting extrusion of the constituent which blended the void plasticity polymer with polyester resin to such technique, and extending a unstretched film, nothing, and this (for example, JP,63-168441,A, JP,2-235942,A). And as an example of such a void plasticity polymer, polypropylene, polystyrene, a polymethylmethacrylate, a poly-methyl pentene, polyphenylene sulfide, a polyphenylene oxide, and mesomorphism polyester are mentioned. By this technique, a void plasticity polymer is distributed in the shape of a particle in a polyester film, and the diameter of a particulate material is dependent on the compatibility and those melt-viscosity differences of a void plasticity polymer and polyester. And by extending the unstretched film which consists of this constituent on at least 1 shaft, sublation occurs in the interface of the void plasticity polymer and polyester which were distributed in the shape of a particle, and a void is formed. In addition to extension conditions, it depends for the grade of void occurrence on the glass transition temperature (Tg) of a void plasticity polymer, and the compatibility of a void plasticity polymer and polyester. The method of obtaining a lightweight-ized polyester film is the technique which does not have the fault mentioned by the technique of the above-mentioned (b), (b), and (c), and was more excellent by blending these void plasticity polymers. However, in the lightweight-ized polyester film which used the above-mentioned polymer which solves and was proposed concretely as a void plasticity polymer, the performance cannot yet be satisfied necessarily.
[0004] For example, since the melt viscosity of these voids plasticity polymer in the melting extrusion

temperature of polyester resin is low when the polymer of comparatively low glass transition temperatures, such as polypropylene, polystyrene, a polymethylmethacrylate, and a poly-methyl pentene, is used as a void plasticity polymer, the void plasticity polymer in the unstretched film which carried out melting extrusion of the constituent and obtained it tends to serve as the cylindrical grain which carried out orientation in the flow orientation of polyester, and it is hard to distribute it to a spherical particle by the shearing stress at the time of melting Therefore, each the unstretched film and oriented film which consist of such a constituent had the trouble where an anisotropy was large. Moreover, if the unstretched film which consists of such a constituent is extended at the temperature more than the glass transition temperature of polyester resin, since the glass transition temperature of a void plasticity polymer is low, it will be easy to deform the dispersed void plasticity polymer plastically, and occurrence of a void will be checked. In addition, the grade of the irregularity with a detailed oriented-film front face becomes inadequate. Therefore, the film which consists of such a constituent is not satisfactory in respect of lightweight-izing and concealment nature and note nature. Since the glass transition temperature of a void plasticity polymer is still low, the trouble where the film which consists of such a constituent has a large performance change at the temperature exceeding it is also pointed out. On the other hand, when polyphenylene sulfide and a polyphenylene oxide are used as a void plasticity polymer, since these polymers have the comparatively high glass transition temperature, there is no above-mentioned **** trouble. However, since the compatibility with polyester is remarkable and these polymers have it, a new trouble generates them. [low] That is, when the unstretched film which consists of such a constituent was extended, excessive sublation occurred in the interface of the void plasticity polymer and polyester which were distributed in the shape of a particle, this grew further and there was a trouble of resulting in fracture of a film. Moreover, although it did not result in fracture, there was a trouble where the intensity as a film was low. Furthermore, polyphenylene sulfide and the polyphenylene oxide are colored in itself, and the film which consists of such a constituent has the fault that it is inferior to a whiteness degree.

[0005] By the technique using mesomorphism polyester as a void plasticity polymer, the trouble produced since the trouble accompanied by being easy to become the cylindrical grain in which it carried out orientation in the flow orientation in the unstretched film, and the compatibility with polyester are remarkable and are low occurs entirely. Moreover, it cannot be overemphasized that it is also inferior to a whiteness degree.

[0006] Since the suitable void plasticity polymer was not discovered in the technique of blending a void plasticity polymer with polyester resin like the above, the actual condition was that the lightweight-ized polyester film which has a satisfactory property was not obtained.

[0007]

[Problem(s) to be Solved by the Invention] It is in offering the polyester film which the technical probrem of this invention found out the void plasticity polymer which has the moderate compatibility and the melt-viscosity difference with polyester, and is a low density and was excellent in an intensity, thermal resistance, concealment nature, and note nature from such a situation using this, and its manufacture technique.

[0008]

[Means for Solving the Problem] This invention persons consist of a constituent with the ring-opening-polymerization field hydride (B) of crystalline polyester resin (A) and a dicyclopentadiene, as a result of repeating a research zealously, in order to solve the above-mentioned technical probrem, find out that the polyester film which has specific structure satisfies the technical probrem of this invention entirely, and reach this invention.

[0009] Namely, less than 95 % of the weight 50 % of the weight or more, (1) crystallinity polyester resin (A) the summary of this invention And it is the polyester film with which the ring-opening-polymerization field hydride (B) of the dicyclopentadiene which has a glass transition temperature higher at least 10 degrees C than crystalline polyester resin consists of 5 to less than (the sum of (A) and (B) is 100 % of the weight) 50% of the weight of a constituent. [or more] The ring-opening-polymerization field hydride (B) of this dicyclopentadiene is distributing 20 micrometers in the shape of

grain from the diameter 0.1 in this polyester film. And the lightweight-ized polyester film which a detailed void exists and is characterized by apparent specific gravity being 0.3 to 1.3, And (2) crystallinity polyester resin Less than 95 % of the weight 50 % of the weight or more (A) And melting extrusion of the constituent which consists of less than (the sum of (A) and (B) is 100 % of the weight) 50 % of the weight is carried out from the amount in which the ring-opening-polymerization field hydride of the dicyclopentadiene which has a glass transition temperature higher at least 10 degrees C than crystalline polyester resin exceeds 5 % of the weight. It consists in the manufacture technique of the lightweight-ized polyester film according to claim 1 characterized by extending the non-extended polyester film obtained 1.5 or more times on at least 1 shaft in the domain of the temperature below crystallization temperature more than the glass transition temperature of this crystalline polyester resin.
[0010] In this invention, it means that the heat of fusion of the crystal which measured crystallinity by 20 degree-C programming rate for /using the differential-thermal-analysis meter shows the value more than 1cal/g. Moreover, crystallization temperature is defined as a crystallization temperature peak at the time of similarly measuring by 20 degree-C programming rate for /using a differential-thermal-analysis meter. A glass transition temperature means the freeze start temperature of the thermal motion of a polymer principal chain as it generally defines. This glass transition temperature can also be measured using a differential-thermal-analysis meter.
[0011] The crystalline polyester resin (A) used in this invention is polyester which makes the main constituents an aromatic dicarboxylic-acid residue, an aliphatic diol residue and/, or an alicyclic diol residue. As an example of representation of such an aromatic dicarboxylic acid, there are a terephthalic acid, an isophthalic acid, a naphthalene dicarboxylic acid, etc. The aromatic ring of these aromatic dicarboxylic acids may be replaced by the halogen, the alkyl group, or other substituents. As an example of representation of an aliphatic diol or an alicyclic diol, there are ethylene glycol, a diethylene glycol, a propylene glycol, a butylene glycol, neopentyl glycol, cyclo hexylene dimethanol, etc. Respectively, two or more kinds are mixed and these aromatic dicarboxylic acids, an aliphatic diol and/, or an alicyclic diol can also be used.
[0012] In this invention, there are a polyethylene terephthalate (PET), a polybutylene terephthalate (PBT), polyethylenenaphthalate (PEN), and polycyclohexylene dimethylene terephthalate (PCT) as suitable crystalline polyester resin (A) especially. The glass transition temperature (Tg), the crystallization temperature (Tc), and the crystal melting temperature (Tm) of these crystallinity polyester resin which were measured using the differential-thermal-analysis meter are as follows.
PET (Tg=70 degree C, Tc=160 degree C, Tm=263 degree C)
PBT (Tg=45 degree C, Tc=130 degree C, Tm=220 degree C)
PEN (Tg=115 degree C, Tc=220 degree C, Tm=272 degree C)
PCT (Tg=90 degree C, Tc=180 degree C, Tm=295 degree C)
[0013] In this invention, you may use the crystalline polyester resin which could be mixed two or more kinds, and could use such crystalline polyester resin, and copolymerized other components.
[0014] After these crystalline polyester resin (A) carries out the direct reaction of an aromatic dicarboxylic acid, an aliphatic diol and/, or the alicyclic diol, is manufactured, and also it carries out the transesterification of the alkyl ester of an aromatic dicarboxylic acid, an aliphatic diol and/, or the alicyclic diol, it is manufactured by the technique of the grade to which a polycondensation is carried out or the polycondensation of the diethylene glycol ester of an aromatic dicarboxylic acid is carried out.
[0015] About the molecular weight of the crystalline polyester resin (A) used in this invention, although it is sufficient if there is especially no limit and there is film organization potency, it is desirable that the intrinsic viscosity measured at 25 degrees C by the mixed solvent of a phenol / tetrachloroethane =1 / 1 (weight ratio) is more than 0.4 (dl/g).
[0016] The ring-opening-polymerization field hydride (B) of the dicyclopentadiene used in this invention is manufactured by the well-known ring-opening-polymerization method of an annular olefin, using a dicyclopentadiene as a monomer, a hydrogenation object is also obtained using the usual hydrogenation reacting method, and it has a glass transition temperature higher at least 10 degrees C than the crystalline polyester resin which constitutes the constituent.

[0017] The ring-opening-polymerization field hydride (B) of the dicyclopentadiene used in this invention hydrogenates the ring-opening-polymerization field, saturates all or a part of the double bonds, and improves heat-resistant degradation nature and photodegradation-proof nature. When the case where all the double bonds of the ring-opening-polymerization field are saturated by hydrogenation is made into 100%, as for the rate of hydrogenation, it is desirable that it is at least 50%, and it is 90% or more 80% or more especially in order to raise thermal resistance and lightfastness.
[0018] The ring-opening-polymerization field hydride (B) of the dicyclopentadiene used in this invention has at least 10 degrees C and a still desirable glass transition temperature high at least 20 degrees C rather than crystalline polyester resin. The glass transition temperature of the ring-opening-polymerization field hydride (B) of a dicyclopentadiene is equivalent to it of crystalline polyester resin, or when lower than it, since the ring-opening-polymerization field hydride (B) of a dicyclopentadiene will deform plastically and generation of a void will be checked if the film which consists of a constituent is extended, it is not desirable. In addition, the grade of the irregularity with the detailed face of an oriented film becomes inadequate. When the ring-opening-polymerization field hydride of the low dicyclopentadiene of such a glass transition temperature is used, the lightweight nature of the extension polyester film obtained as a result, concealment nature, and note nature are not satisfactory.
[0019] There is especially no limit about the molecular weight of the ring-opening-polymerization field hydride (B) of the dicyclopentadiene used in this invention, and in the temperature at the time of the melting extrusion of a constituent, if it is the molecular weight of the melt viscosity of crystalline polyester resin which gives 1/10 or more melt viscosities at least, it is sufficient.
[0020] The loadings of the crystalline polyester resin which is (A) component of the constituent which constitutes the lightweight-ized polyester of this invention are less than 95 % of the weight from 50 % of the weight or more, and it of the ring-opening-polymerization field hydride of the dicyclopentadiene of (B) component is less than 50 % of the weight from the amount exceeding 5 % of the weight. (B) There are few amounts of generation of the detailed void in the final extension polyester film with which the loadings of the ring-opening-polymerization field hydride (B) of the dicyclopentadiene of a component are obtained at less than 5 % of the weight, and they become inadequate [lightweight nature and concealment nature and note nature]. Conversely, since the intensity of a film falls in the amount in which it exceeds 50 % of the weight, the thermal stability at the time of the melting extrusion of a constituent falls the fracture at the time of extension not only becomes easy to happen, but and a pyrolysis etc. occurs, it is not desirable.
[0021] In the lightweight-ized polyester film of this invention, the ring-opening-polymerization field hydride of the dicyclopentadiene of (B) component requires that a diameter should distribute 0.1 to 20 micrometers in the shape of grain in the matrix which consists of crystalline polyester resin which is (A) component, and the domains of it are 1-15micro preferably. In this case, as for the particle of the ring-opening-polymerization field hydride (B) of a dicyclopentadiene, it is desirable that it is a globular form as much as possible. Since the film which was hard to generate the different rectangle of a film in the globular form case, and the uniform void generated by extension, and was excellent in the intensity is obtained, it is desirable. When the diameter of a particle of the ring-opening-polymerization field hydride (B) of a dicyclopentadiene is less than 0.1 micrometers, there are few amounts of generation of the void in an extension polyester film, and they become inadequate [lightweight nature and concealment nature and note nature]. Conversely, when it exceeds 20 micrometers, there are many amounts of generation of a void, and although excelled in lightweight nature and concealment nature, since the intensity of a film falls and the fracture at the time of extension becomes easy to happen, it is not desirable.
[0022] In this invention, a unstretched film carries out melting extrusion of the constituent which consists of a ring-opening-polymerization field hydride (B) of crystalline polyester resin (A) and a dicyclopentadiene, and is obtained. In this case, melting kneading of the ring-opening-polymerization field hydride (B) of crystalline polyester resin (A) and a dicyclopentadiene is carried out using an extruder etc., it may make with the pellet of a constituent beforehand, subsequently melting extrusion of this may be carried out, and a unstretched film may be obtained. Or the ring-opening-polymerization

field hydride (B) of crystalline polyester resin (A) and a dicyclopentadiene may be blended, direct melting extrusion of this may be carried out, and a unstretched film may be obtained. As melting extrusion temperature, it is usually chosen out of the crystal melting temperature of crystalline polyester resin (A) in the domain of temperature higher 50 degrees C than it. It extrudes from a T die or a circular die, and is cooled below at the glass transition temperature of crystalline polyester resin (A), and the constituent by which melting was carried out obtains an amorphous film substantially. There is no generation of a void in this unstretched film, and, in many cases, it is substantially transparent or translucent to it.

[0023] Subsequently, this unstretched film is extended by at least 1 shaft orientations. Extension is performed at the temperature of the domain below crystallization temperature more than the glass transition temperature of crystalline polyester resin (A). A void is effectively generated by the interface with the ring-opening-polymerization field hydride (B) of the dicyclopentadiene which forms a particle at the same time the crystalline polyester resin (A) which forms a matrix by extending by this temperature requirement carries out orientation crystallization. A draw magnification has big influence on the property of the film obtained. The lightweight nature of the film obtained so that a draw magnification is large, concealment nature, and an intensity improve. Although it is possible to select a draw magnification according to the purpose, in order to attain the purpose of this invention, to extend to 1.5 or more times is required for at least 1 shaft. It is also possible to extend to in-every-direction biaxial furthermore. In this case, enhancement in a property can be aimed at further. Also in this case, it is desirable to extend 1.5 or more times in each orientation.

[0024] The heat setting of the polyester film after extension is carried out if needed. The dimensional stability of an extension polyester film increases further by this processing. Usually, temperature of a heat setting is performed at temperature low 30 degrees C from about 10 degrees C from the crystal melting temperature of crystalline polyester resin (A).

[0025] When the lightweight-ized polyester film of this invention performs the aforementioned extension, 1.3 or less are the apparent specific gravity. It is also possible to make apparent specific gravity or less into 0.3 by raising a draw magnification further. However, since the productivity of an oriented film and a strong fall arise, as for the apparent specific gravity of a lightweight-ized polyester film, it is desirable that it is in the domain of 0.3 to 1.3. The domain of the most desirable specific gravity from a productivity or the field of a performance is 0.5 to 1.0.

[0026] You may blend other polymers with the aforementioned constituent which consists of a ring-opening-polymerization field hydride (B) of the crystalline polyester resin (A) of this invention, and a dicyclopentadiene in the domain which does not spoil the property greatly if needed. As such a polymer, there are polyethylene, polypropylene, polystyrene, a poly-methyl pentene, a polymethylmethacrylate, ABS plastics, a polycarbonate, a polyamide, a polyphenylene oxide, a polyarylate, a polyethylene glycol, a poly-ape phon, a polyether ape phon, a polyether ether ketone, polyphenylene sulfide, a phenoxy resin, a polyvinyl chloride, a polyvinylidene chloride, liquid crystal polyester, a ****** resin, phenol resin, melamine resin, a urea resin, an epoxy resin, etc.

[0027] Moreover, it is the domain which does not spoil the property greatly to the constituent of this invention, and it is also possible to blend minerals fillers and pigments, such as a silica, titanium oxide, a calcium carbonate, an alumina, a kaolin, a mica, and talc, if needed.

[0028] Moreover, it is also possible to blend other additives. As such an example, there are an antioxidant, a heat-resistant agent, an antistatic agent, an ultraviolet ray absorbent, a lubricant, a coloring agent, etc.

[0029] The lightweight-ized polyester film of this invention is used for the charge of packing material, a label, an informational magazine, drawing paper, a print sheet, etc., after coming out independently or processing paint, printing, a metallizing, etc. Moreover, the lightweight-ized polyester film of this invention can also be used as one of the constituents of the multilayer-structure field. A laminate film, a compound sheet, a composite, etc. occur as an example of such multilayer-structure field.

[0030]

[Example] Although an example explains this invention still concretely below, this invention is not

limited to these.
[0031] (Example of reference) Toluene 400ml, dicyclopentadiene 100ml, the 1-hexene 0.37m mol, the tungsten-hexachloride 0.37m mol, and the tetraethyl tin 0.74m mol were added, the polymerization was carried out at the room temperature for 5 hours, and the ring-opening-polymerization field (** -1) was acquired. The inside of 400g of ****** 5% solutions and palladium carbon 2g curing units was replaced by hydrogen to cyclo [of the ring-opening-polymerization field], the hydrogenation reaction was performed, and hydrogenation load coalesce (** -2) was obtained. The hydride of the ring-opening-polymerization field of other dicyclopentadienes was created similarly. These are shown in Table 1. In addition, the crystalline polyester resin (A) used in the example is as Table 2.
[0032]
[Table 1]

ポリマー	水添反応条件		水添率	Ｔｇ
	温度（℃）	時間（ｈ）	（％）	（℃）
ア－１	－	－	－	１２９
ア－２	１２０	４	５７	１３１
ア－３	１２０	１２	８５	１３３
ア－４	１４０	８	９８	１３４

[0033]
[Table 2]

	結晶性ポリエステル樹脂	極限粘度 [η]
イ－１	ポリエチレンテレフタレート	０．７８
イ－２	ポリエチレンナフタレート	０．６８

[0034] (Examples 1-6) The vacuum drying of the pellet used as a raw material was carried out at 120 degrees C for 48 hours using the **** type vacuum dryer made from ******, and the ring-opening-polymerization field hydride pellet of 0.001% of a dicyclopentadiene and the limiting viscosity obtained [the moisture regain] the polyethylene-terephthalate pellet of 0.78, respectively. These specified quantity was mixed by the Henschel mixer, and the melting knockout and the sheet with a thickness of 500 micrometers were obtained by the T die on 280-degree C conditions using 50mmphi extruder made from Made-in-Japan Steel. Subsequently, it extended 3 times to MD (lengthwise) at 90 degrees C at 3

times and TD (longitudinal direction), and the film with a thickness of 55micro was obtained. The diameter of a particulate material of the ring-opening-polymerization field hydride of the dicyclopentadiene in a unstretched film, ductility, and the apparent specific gravity of an oriented film, a 3-dimensional surface roughness, Hz and Tp, G %, a whiteness degree, tensile strength and note nature are shown in Tables 3 and 4. Moreover, when a polyethylenenaphthalate resin was used as crystalline polyester resin, it carried out on conditions with a film production temperature [of 300 degrees C], and an extension temperature of 125 degrees C. The performance of a film etc. is similarly shown in Tables 3 and 4.

[0035]

[Table 3]

	ポリマー	配合比 (wt%)	添加ポリマー Tg(℃)	未延伸フイルム粒子径 (μm)	延伸		
					温度 (℃)	倍率 MD×TD	延伸性
実施例1	ア－2 イ－1	20 80	131	2～15	90	3×3	良好
実施例2	ア－3 イ－1	20 80	133	2～15	90	3×3	良好
実施例3	ア－4 イ－1	20 80	134	2～15	90	3×3	良好
実施例4	ア－4 イ－1	10 90	134	2～15	90	3×3	良好
実施例5	ア－4 イ－1	30 80	134	2～18	90	3×3	良好
実施例6	ア－4 イ－2	20 80	134	1～10	125	3×3	良好

[0036]

[Table 4]

	延伸フイルム								筆記性
	比重	表面粗度 SRa	表面粗度 SPc	Hz (%)	Tp (%)	G% (%)	白色度	強度 (kg/mm²)	
実施例1	0.62	0.38	70	85	1.5	3.1	95	11	◎
実施例2	0.58	0.40	74	92	0.9	1.1	104	10	◎
実施例3	0.53	0.41	81	95	0.8	0.9	108	9	◎
実施例4	0.93	0.27	58	86	1.6	2.8	96	13	○
実施例5	0.50	0.42	95	96	0.7	0.8	109	9	◎
実施例6	0.91	0.23	53	83	1.9	3.1	90	14	○

[0037] (Examples 1-7 of a comparison) By the same technique as an example, the pellet was dried and the unstretched film with a melting knockout thickness of 500 micrometers was obtained. Extension temperature was carried out on conditions (90 degrees C, 60 degrees C, and 200 degrees C). Moreover, the draw magnification carried out 1.2x1.0 times except 3x3 times. Moreover, the polyphenylene-oxide resin (Nagase& Co., Ltd. PPO- 534) was used for the addition polymer as a comparison of the ring-opening-polymerization field hydride of a dicyclopentadiene. The performance of a film is shown in Tables 5 and 6.

[0038]

[Table 5]

	ポリマー	配合比 (wt%)	添加ポリマー Tg(℃)	未延伸フイルム粒子径 (μm)	延伸		
					温度 (℃)	倍率 MD×TD	延伸性
比較例1	ア－1 イ－1	20 80	129	0．3～5	90	3×3	不良
比較例2	ア－4 イ－1	3 97	134	2～15	90	3×3	良好
比較例3	ア－4 イ－1	55 45	134	粒子無し	90	3×3	不良
比較例4	ア－4 イ－1	20 80	134	2～15	60	3×3	不良
比較例5	ア－4 イ－1	20 80	134	2～15	200	3×3	不良
比較例6	ア－4 イ－1	20 80	134	2～15	90	1.2×1	良好
比較例7	PPO イ－1	20 80	185	5～30	90	3×3	良好

[0039]
[Table 6]

	延伸フイルム								筆記性
	比重	表面粗度 SRa	表面粗度 SPc	Hz (%)	Tp (%)	G% (%)	白色度	強度 (kg/mm^2)	
比較例1	1.11	0.12	45	77	5.0	6.7	76	11	×
比較例2	1.29	0.09	14	46	29	25	82	17	×
比較例3	—	—	—	—	—	—	—	—	—
比較例4	—	—	—	—	—	—	—	—	—
比較例5	1.30	0.09	15	45	28	25	82	15	×
比較例6	1.30	0.01	3	20	70	97	75	5	×
比較例7	0.78	0.30	95	95	0.8	0.9	70	6	○

[0040] Examples 1-7 and the examples 1-7 of a comparison show the following thing. By the film obtained from the constituent with crystalline polyester resin when the rate of a hydrogenation of the ring-opening-polymerization field hydride of a dicyclopentadiene is 0% lacking in a thermal stability, when that ductility is bad and the ring-opening-polymerization field hydride of a dicyclopentadiene are 3 % of the weight, the ring-opening-polymerization field hydride constituent film of crystalline polyester resin and a dicyclopentadiene understands that lightweight nature and matte nature and white nature are missing similarly. Moreover, when the ring-opening-polymerization field hydride of a dicyclopentadiene is 55 mol %, the diameter of a particulate material is not checked and the ring-opening-polymerization field hydride constituent film of crystalline polyester resin and a dicyclopentadiene is understood that ductility is bad. About extension temperature, although 90 degrees C is good, at 60 degrees C, a film fractures and it is inferior to ductility. When it extends at 200 degrees C, it turns out that film thickness

nonuniformity lacks film quality in size at thing [which is being fallen greatly] and lightweight nature, and matte nature and white nature. By 1.2x1.0 times, it turns out that lightweight nature and matte nature and white nature are missing also about a draw magnification. Moreover, in the example 7 of a comparison, it turns out that the intensity of the film obtained when the particulate material exceeded 20 micrometers falls remarkably.

[0041] (Measuring method) The measuring method used in the example is as follows.

1. Use a JSM[by particle-diameter JEOL Co., Ltd.]-15 type scanning electron microscope, and read a dimension in the electron microscope photograph of the sample fracture surface.
2. According to apparent specific gravity JISK6758, it measured by the underwater substitution method.
3. a surface roughness -- the Kosaka Lab tabulation side granularity measuring instrument SE-3AK type was used, and it measured according to the technique of JISB-0601-1976 2 micrometers of the diameters of a sensing pin and ****** 10mg.SRa express a longitudinal-plane-of-symmetry average of roughness height (mum), and SPc expresses threads per inch (an individual / 0.1mm2).
4. Degree (Hz) Parallel Ray Transmittance (Tp) [of Overcast]

The hazemeter made from the Tokyo **** was measured according to use and ASTMD 1003-61.

5. G% Murakami color technical research center Gloss Meter The GM-30 type was used and glossiness with an incident angle of 20 degrees was measured.
6. It measured using the whiteness-degree **** testing-machine SM-4 type color difference meter.
7. Intensity (Tensile Strength)

The Shimazu DSS-500 type autograph was used, and it measured according to ASTMD882, and expressed as the average of length and longitudinal direction.

8. Note nature pencil **** or Uni for a **** examination by pencil Mitsubishi was used, and it wrote down by 500g of press, and when a character was able to be written deeply, O and when it was able to write very deeply, O and the case of being thin were made into x.

[0042]

[Effect of the Invention] As the example explained concretely, by using a specific void plasticity polymer, the extremely excellent lightweight nature, an intensity, thermal resistance, concealment nature, note nature, and a productivity are given, and the lightweight-ized polyester film of this invention exceeds the performance of conventional lightweight-ized polyester greatly in these points.

[Translation done.]